CLAIMS

1. A deposition system comprising:

a deposition chamber having an inlet port;

a first reservoir configured for containment of a first metastable specie, the first reservoir comprising an outlet port in selective fluid communication with the inlet port of the deposition chamber; and

a metastable-specie generating catalyst within the first reservoir.

2. The deposition system of claim 1 wherein the catalyst comprises Pt.

3. The deposition system of claim 1 wherein the catalyst comprises Zn.

4. The deposition system of claim 1 further comprising a heat source configured to heat the catalyst.

5. The deposition system of claim 1 further comprising a carrier gas source in selective fluid communication with the deposition chamber through the inlet port.

6. The deposition system of claim 1 further comprising:

a substrate platform; and

a dispersion head between the inlet port and the substrate platform.

7. The deposition system of claim 1 further comprising:

a second reservoir configured for containment of a second metastable specie, the second reservoir comprising a second reservoir outlet port in selective fluid communication with the deposition chamber.

8. The deposition system of claim 7 wherein the inlet port of the deposition chamber is a first inlet port, the deposition chamber further comprising a second inlet port, wherein the outlet port of the second reservoir is in selective fluid communication with the deposition chamber through the second inlet port.

9. The deposition system of claim 7 wherein the metastable-specie generating catalyst is a first metastable-specie generating catalyst, and further comprising a second metastable-specie generating catalyst within the second reservoir.

10. The deposition system of claim 7 further comprising a carrier gas source in selective fluid communication with the deposition chamber through the second inlet port.

11. The deposition system of claim 7 further comprising:

a remote metastable specie source, wherein the second reservoir comprises an inlet port in fluid communication with the remote metastable specie source.

12. The deposition system of claim 11 wherein the remote metastable specie source comprises a metastable specie generator comprising one or more of a plasma sorce, a catalyst, a heater, an electron gun, a UV light source and a microwave source.

13. A deposition apparatus comprising:

a deposition chamber having a first volume;

at least one containment reservoir fluidly connected to the deposition chamber and having a second volume, the second volume at least about 1% of the first volume;

a remote metastable specie source in fluid communication with at least one of the containment reservoirs.

14. The apparatus of claim 13 wherein the second volume is greater than or equal to about 10 % of the first volume.

15. The apparatus of claim 13 wherein the second volume is greater than or equal to about 50 % of the first volume.

16. The apparatus of claim 13 wherein the second volume is equal to or greater than the first volume.

17. An atomic layer deposition apparatus comprising:

a deposition chamber having a first inlet, a second inlet, a dispersion head, and a substrate platform; the dispersion head being positioned between the first inlet and the substrate platform and between the second inlet and the substrate platform;

a first activated specie containment reservoir in fluid communication with the deposition chamber through the first inlet;

a second activated specie containment reservoir in fluid communication with the deposition chamber through the second inlet; and

one or more carrier gas sources configured to deliver carrier gas through at least one of the first inlet and the second inlet.

18. A method of providing material into a deposition chamber comprising:

providing one or more reservoirs in fluid communication with a deposition chamber;

providing at least one metastable specie within at least one of the reservoirs; and

flowing the at least one metastable specie from the at least one reservoir into the deposition chamber, the flowing the at least one metastable specie comprising:

introducing the at least one metastable specie into the deposition chamber through an inlet; and

passing at least a portion of the at least one metastable specie through a disperser.

19. The method of claim 18 wherein the deposition chamber is an ALD chamber.

20. The method of claim 18 wherein the one or more reservoirs are two reservoirs.

21. The method of claim 18 further comprising:

activation of a substance within at least one reservoir to form at least one of the metastable specie.

22. The method of claim 18 further comprising:

remotely forming at least one metastable specie; and

providing the remotely formed metastable specie into at least one reservoir in metastable form.

23. The method of claim 18 wherein the at least one metastable specie comprises two metastable species; one of the two metastable species being a first metastable specie and another of the metastable species being a second metastable specie.

24. The method of claim 23 wherein the first metastable specie and the second metastable specie are flowed into the deposition chamber sequentially relative to one another.

25. The method of claim 24 wherein the chamber is purged after flowing the first metastable specie and before flowing the second metastable specie.

26. The method of claim 23 wherein at least some of the first metastable specie and at least some of the second metastable specie are flowed into the deposition chamber simultaneously.

27. A layer deposition method comprising:

providing a catalyst within a activation reservoir;

providing a hydrogen source in fluid communication with the activation reservoir;

catalytically generating activated hydrogen within the activation reservoir; and

flowing the activated hydrogen from the activation reservoir into a reaction chamber.

28. The layer deposition method of claim 27 wherein the catalyst comprises Pt.

29. The layer deposition method of claim 27 further comprising providing $TiCl_4$ to the reaction chamber.

30. A layer deposition method comprising:

providing a substrate within a deposition chamber;

remotely generating activated hydrogen;

flowing the activated hydrogen into a first pre-deposition-chamber reservoir;

flowing the activated hydrogen from the pre-deposition-chamber reservoir into a deposition chamber; and

adsorbing at least a portion of the activated hydrogen onto a substrate.

31. The layer deposition method of claim 32 further comprising:

flowing $TiCl_4$ into the deposition chamber; and

adsorbing at least a portion of the $TiCl_4$ onto the substrate.

32. A method of depositing material on a substrate comprising:

generating a first metastable specie;

containing the first metastable specie within a first reservoir, the first reservoir having a first volume;

flowing the first metastable specie from the first reservoir into a deposition chamber having a second volume, the second volume being at least 1.0 % of the first volume; and

depositing at least some of the first metastable specie onto a substrate.

33. The method of claim 34 wherein the flowing of the metastable specie from the reservoir into the chamber comprises flushing the metastable specie from the reservoir by flowing a carrier gas.

34. The method of claim 35 wherein the flowing of the carrier gas comprises flowing the carrier gas through the reservoir.

35. The method of claim 34 wherein the generating occurs within the first reservoir.

36. The method of claim 34 wherein the generating of the first metastable specie is remote from the first reservoir and wherein the method further comprises flowing the metastable specie into the reservoir.

37. The method of claim 34 wherein the generating comprises activation of at least one precursor utilizing one or more of heat activation, plasma activation and catalytic activation.

38. The method of claim 34 wherein the generating occurs within the first reservoir and comprises activation of at least one precursor by providing a catalyst within the first reservoir.

39. The method of claim 34 further comprising generating a second metastable specie.

40. The method of claim 41 further comprising:

containing the second metastable specie within a second reservoir, wherein the second reservoir is in selective fluid communication with the deposition chamber; and

flowing the second metastable specie from the second reservoir into the deposition chamber.

41. The method of claim 42 wherein the flowing of the first metastable specie into the deposition chamber and the flowing of the second metastable specie into the deposition chamber at least partially overlap.

42. The method of claim 42 wherein the flowing of the first metastable specie into the deposition chamber and the flowing of the second metastable specie into the deposition chamber do not overlap.

43. The method of claim 44 further comprising:

purging the deposition chamber between the flowing of the first metastable specie and the flowing of the second metastable specie.

44. The method of claim 41 wherein the second metastable specie is the same as the first metastable specie.

45. An atomic layer deposition method comprising:

providing an metastable-specie-containment reservoir in selective fluid communication with a reaction chamber;

containing a metastable specie in the metastable-specie-containment reservoir; and

flowing the metastable specie from the metastable-specie-containment reservoir into the reaction chamber, the flowing comprising:

purging the metastable-specie-containment reservoir, wherein the purging flushes the metastable specie from the metastable-specie-containment reservoir into the reaction chamber through one or more metastable-specie inlets; and

compressing the metastable specie into the reaction chamber, the reaction chamber comprising a volume that is less than an initial volume occupied by the metastable specie prior to the flowing from the metastable-specie-containment reservoir.

46. The method of claim 47 wherein the metastable-specie-containment reservoir is a first metastable-specie containment reservoir and the metastable specie is a first metastable specie, the method further comprising:

providing a second metastable-specie-containment reservoir;

flowing a second metastable specie from the second metastable-specie-containment reservoir.

47. The method of claim 47 wherein the one or more metastable-specie inlets comprises an metastable-specie inlet having a valve.

48. The method of claim 47 further comprising:

providing a substrate platform with in the reaction chamber; and

providing a dispersion head between the one or more metastable specie inlets, collectively, and the substrate platform, wherein the flowing from metastable-specie-containment reservoir further comprises passing the metastable specie through the dispersion head.